



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

Docket No. FAA-2013-0905; Notice No. 25-13-28-SC

Special Conditions: Airbus, Model A350-900 Series Airplane; Flight Envelope

Protection: Normal Load Factor (g) Limiting

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed special conditions.

SUMMARY: This action proposes special conditions for Airbus Model A350-900 series airplanes. These airplanes will have a novel or unusual design feature(s) associated with a flight control system that prevents the pilot from inadvertently or intentionally exceeding the positive or negative airplane limit load factor. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These proposed special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: Send your comments on or before **[insert a date 45 days after date of publication in the Federal Register]**.

ADDRESSES: Send comments identified by docket number FAA-2013-0905 using any of the following methods:

- Federal eRegulations Portal: Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.

- Mail: Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, D.C., 20590-0001.
- Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except federal holidays.
- Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

Docket: Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except federal holidays.

FOR FURTHER INFORMATION CONTACT: Joe Jacobsen, FAA, Airplane and Flightcrew Interface Branch, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057-3356; telephone (425) 227-2011; facsimile (425) 227-1320.

SUPPLEMENTARY INFORMATION:

Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive on or before the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change these proposed special conditions based on the comments we receive.

Background

On August 25, 2008, Airbus applied for a type certificate for their new Model A350-900 series airplane. Later, Airbus requested and the FAA approved an extension to the application for FAA type certification to June 28, 2009. The Model A350-900 series has a conventional layout with twin wing-mounted Rolls-Royce Trent XWB engines. It features a twin aisle 9-abreast economy class layout, and accommodates side-by-side placement of LD-3 containers in the cargo compartment. The basic Airbus Model A350-900 series configuration will accommodate 315 passengers in a standard two-class arrangement. The design cruise speed is Mach 0.85 with a Maximum Take-Off Weight of 602,000 lbs. Airbus proposes the Model A350-900 series to be certified for extended operations (ETOPS) beyond 180 minutes at entry into service for up to a 420-minute maximum diversion time.

The normal load factor limit on Airbus Model A350-900 series airplanes is unique in that traditional airplanes with conventional flight control systems (mechanical linkages) are limited in the pitch axis only by the elevator surface area and deflection limit. The elevator control power is normally derived for adequate controllability and maneuverability at the most critical

longitudinal pitching moment. The result is that traditional airplanes have a significant portion of the flight envelope wherein maneuverability in excess of limit structural design values is possible.

Title 14 Code of Federal Regulations (14 CFR) part 25 sections do not specify requirements or policy for demonstrating maneuver control that impose any handling qualities requirements beyond the design limit structural loads. Nevertheless, some pilots have become accustomed to the availability of this excess maneuver capacity in case of extreme emergency such as upset recoveries or collision avoidance.

These proposed special conditions are needed to ensure adequate maneuverability and controllability for the Model A350-900 series using the Airbus flight control system.

Under Title 14, Code of Federal Regulations (14 CFR) 21.17, Airbus must show that the Model A350-900 series meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25-1 through 25-128.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model A350-900 series because of a novel or unusual design feature, special conditions are prescribed under § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same or similar novel or unusual design feature, the proposed special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and proposed special conditions, the Airbus Model A350-900 series must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36 and

the FAA must issue a finding of regulatory adequacy under § 611 of Public Law 92-574, the "Noise Control Act of 1972."

The FAA issues special conditions, as defined in 14 CFR 11.19, under § 11.38, and they become part of the type-certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The Airbus Model A350-900 series will incorporate the following novel or unusual design features: a flight control system that prevents the pilot from inadvertently or intentionally exceeding the positive or negative airplane limit load factor.

Discussion

Flight envelope protection that limits normal load factor (g) limiting is considered novel and unusual because the current regulations do not provide standards for maneuverability and controllability evaluations for such systems. Special conditions are needed to ensure adequate maneuverability and controllability when using this design feature.

As with the previous fly-by-wire airplanes, the FAA has no regulatory or safety reason to inhibit the design concept of the Airbus A350 flight control system with load factor limiting. Pilots accustomed to this control feature may feel more freedom in commanding full stick displacement maneuvers because of the following:

- 1) Knowledge that the limit system will protect the structure,
- 2) Low stick force/displacement gradients, and
- 3) Smooth transition from pilot elevator control to limit control.

Applicability

As discussed above, these proposed special conditions apply to Airbus Model A350-900 series airplanes. Should Airbus apply later for a change to the type certificate to include another

model incorporating the same novel or unusual design feature, the proposed special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on the Airbus Model A350-900 series airplanes. It is not a rule of general applicability.

List of Subjects in 14 CFR part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Proposed Special Conditions

Accordingly, the Federal Aviation Administration (FAA) proposes the following special conditions as part of the type certification basis for Airbus Model A350-900 series airplanes.

To meet the intent of adequate maneuverability and controllability required by § 25.143(a), and in the absence of other limiting factors, the following special condition is proposed:

1. The positive limiting load factor must not be less than:
 - a) 2.5g for the EFCS normal state with the high lift devices retracted up to V_{MO}/M_{MO} . The positive limiting load factor may be gradually reduced down to 2.25g above V_{MO}/M_{MO} .
 - b) 2.0g for the EFCS normal state with the high lift devices extended.
2. The negative limiting load factor must be equal to or more negative than:
 - a) Minus 1.0g for the EFCS normal state with the high lift devices retracted.
 - b) 0.0g for the EFCS normal state with high lift devices extended.
3. Maximum reachable positive load factor wings level may be limited by flight control system characteristics or flight envelope protections (other than load factor protection) provided:

a) That the required values are readily achievable in turns and

b) that wings level pitch up responsiveness is satisfactory.

4. Maximum achievable negative load factor may be limited by flight control system characteristics or flight envelope protections (other than load factor protection) provided:

a) pitch down responsiveness is satisfactory

b) from level flight, 0g is readily achievable or alternatively, a satisfactory* trajectory change is readily achievable at operational speeds (from V_{LS} to max speed - 10kts). V_{LS} is the lowest speed that the crew may fly with auto thrust or auto pilot engaged. It is displayed on primary flight displays as the top of the low speed amber band, and is the lower end of the normal flight envelope. Max speed – 10kts is proposed to cover typical margin from V_{MO}/M_{MO} to cruise speeds and typical margin from V_{FE} to standard speed in high lift configurations.

* For the FAA to consider a trajectory change as satisfactory, the applicant should propose and justify a pitch rate that provides sufficient maneuvering capability in the most critical scenarios.

Compliance demonstration with the above requirements may be performed without ice accretion on the airframe.

Issued in Renton, Washington, on October 22, 2013.

Stephen P. Boyd
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Aircraft Certification Service

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